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DECISION UNDER UNCERTAINTY

What are you doing to improve your ability to develop and introduce new products, services, process, and strategy ideas? Are you using yesterday's methods to manage today's complex marketplace challenges?

The key business opinion leaders — the gurus of modern day — speak clearly: only companies that can consistently bring creativity, find a new way, and are able to introduce new products/services/channels, will survive and grow in today's rapidly changing market. The stock market trends reveal a consistent depression, which is the result of the frustration of most companies to turn ideas into profitable realities.

A Radical Change of Perspective

So, what is the problem? The fact is that most companies concentrate their efforts on updating the existing portfolio with only cosmetic changes, new variants, and slightly different formulations to fuel growth. In reality, this so-called *incrementalism* barely ensures survival, but does not enable sustainable growth. Surviving is not enough in today's rapidly changing market place.

So what are companies doing? Many companies are merely focussing on incremental improvement, not real breakthroughs, as managers and innovators concentrate on improving current reality. This behavior leads to short-term actions not aligned to strategy. It is like play to avoid losing!

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A new *way of thinking* is needed:

- thinking the unthinkable,
- challenging the status quo, and
- taking calculated risks

will expose the new areas for opportunities. These key drivers will lead naturally towards renewed growth, profitability, management achievement, and employee satisfaction.

How can we create a new future? By defining a strategic direction to guide short- and long-term activity, focussing on creating a new paradigm, and an attitude to play to win. The growth agenda will fold out naturally — and this is what matters.

Many corporate entities are still seeking an easy way to achieve growth via mergers and acquisitions — see the recent P&G moves in acquiring Gillette, Clairol, … and who knows what else! But is growth through mergers and acquisitions a sustainable path? We do not think so: in the limit, this path will be self-limited by anti-trust issues, by the company culture clash and by the lack of a healthy competition.

There are a number of alternative avenues available to pursue growth, which include adding new products and services and entering new markets or businesses. Yet, perhaps the most effective way to generate breakthrough and increase growth is often neglected: connecting with the consumer, and extending the customer relationship and leveraging the internal force, which is hiding inside everyone within the organisation!

In 2003 Larry Kellam, director of supply-network innovation at Procter & Gamble, stated that P&G was rethinking Supply Chain, working toward a vision called "the consumer-driven supply network." That differs from P&G supply-chain strategy of the past as consumer focussed, and it envisions a network rather than a chain. Therefore, a U-turn from the cost mentality to consumer–customer services is a must do, based on real time and all network participants working to add value for the consumer.

Consumer Driven Supply Network (CDSN) capabilities/technologies needed to implement a lean and responsive supply network are more speculative at this time. P&G paint a picture of "Flexi-plants" that react very quickly, supported by Just in Time (JIT) materials from suppliers.

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Shortening end-to-end replenishment lead times ameliorates the impact of uncertainty in the supply network and reduces cycle times, enabling inventory to be taken out. But the supply network trade-offs here can be complex to quantify. P&G's approach has been to develop simulation models to show how increasing frequencies for production and transportation trade-off against inventory and service levels. P&G is investing in areas to support this direction; for example, real-time planning of the supply network is a key enabler of CDSN and underlies P&G's investment in BIOS Group and P&G's fostering a joint development between SAP and BIOS Group.

Therefore, what keeps the CEO awake at night is not only the preoccupation of reaching top and bottom line growth, but also employee and customer satisfaction. There is a new pressure coming from the world of capital markets: investors and shareholders are becoming more proactive in influencing boardrooms. This trend for investors to intervene originated in the US, but it is now spreading rapidly into the UK, European and Asian stock markets.

The pressure is now on for companies to deliver the goods. Single digit growth is not enough to satisfy the city's investors, and companies need to step-up their game to deliver year-on-year sustainable above-average returns.

Investors are becoming more and more interventionists in the management decision-making processes, once sole territory of corporate boardrooms. There is a clear message, here:

"Executives must create value or someone else will do it for them!"

The power of the capital markets is increasing over and beyond every expectation, and is setting the rules of the game in politics and in international economics. We need to buy into the new rules of the game!

The capital market 'mighties' are pushing corporations for readily available, reliable, and comparable information — so they can judge the company's performance. Why do they need this? This is to be able to make comparative judgements of a company's performance; to be able to do so across various sectors; and to be able to do so on an equitable basis. We need to develop the right tools to support comparative judgements!

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The New Business Drivers

The rules that determine sustained competitive advantage and upon which superior financial results depend have shifted into a new paradigm (Donnellan, 2000). Four core beliefs have been shifted from the old to the new concepts as follows:

From	→	To
Market share	→	Value of market
Product Power	→	Customer Power share
Revenue & P&L	→	Cash
Technology	→	Business design

We need a new way of thinking and making decisions that can assess the impact on the value of reducing lead-time, changing the configuration of the supply-demand chain, rationalizing the product range, or focusing on a smaller number of key customers. The approach combines the historic perspective with a predictive, forward-looking view, and also embraces the non-financial drivers of the business. It should be a systematic bridge linking executive management with front line managers out in operations. It should be a common decision-making system based upon the overarching objective of enhancing shareholder value (Rappaport, 1986).

The three most important things that you need to measure in a business are customer–consumer satisfaction, employee satisfaction, and cash flow. How do you measure customer–consumer satisfaction and employee satisfaction? What techniques should be used? Jack Welsh of G.E. said “If you cannot measure it, you cannot control it”. If you are growing customer–consumer satisfaction, this is reflected in the fact that your global market share grows. This is the main output indicator to be measured — which can be combined with other specific indicators, which measure satisfaction along the value chain, such as customer surveys, service level agreements target reviews, output reliability, and so on.

Employee satisfaction gets you productivity, quality, pride, and creativity. Again, there are several ways to amplify employee satisfaction currently in use in the field, such as periodic people surveys, the merit index, and so on.

More and more companies are shying away from historic, retrospective financial reporting, and have moved to new decision support systems that are forward-looking, predictive, and responsive. This reflects what is

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happening in the business, and outside it, by using, for example, a combination of financial and non-financial data. Their decision-making processes are highly informed. Traditional focus on tracking budget variances, crunching the period-end numbers and preparing statutory reports is being changed. It is all about 'accounting for value' not 'accounting for profit'. Accounting for value brings absolute transparency to the hidden sources of wealth creation in the enterprise.

In benchmarking a company, analysts now compare the performance level that is being achieved against the major drivers of free cash flow (see Figure 1.1). Then they add in the benchmark of how much free cash flow per share is being generated. Executive management sees, often for the first time, just how far they are lagging behind the returns that their nearest competitors are providing to their own shareholders.

By measuring performance *ad hoc*, executive management measures the strength of the competitive fundamentals of these differing businesses and can analyze the results of the alternate strategies.

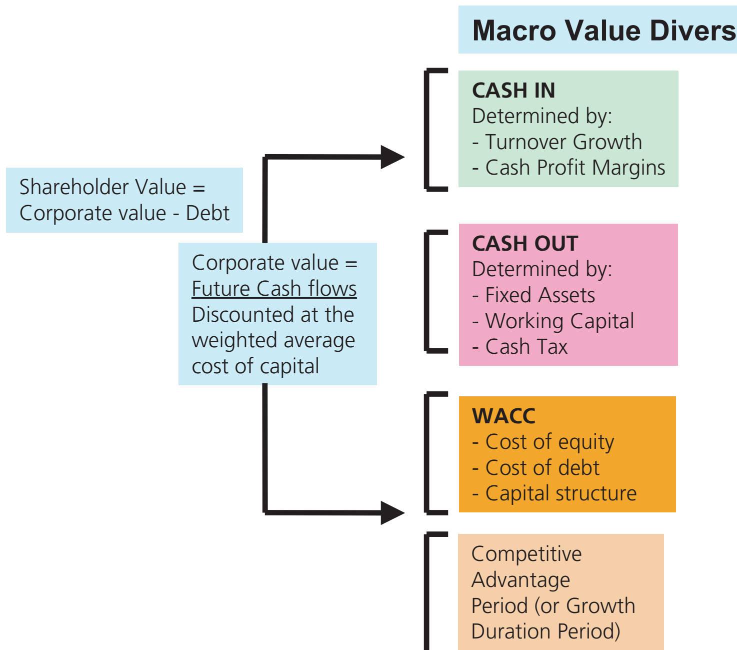

Figure 1.1. The value drivers.

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But is this enough? Executive management has to be increasingly more agile in the way it responds to the changing field of competitive play on its day-to-day decisions. Management can use the same value analysis methods in a forward-looking decision-making process.

The creation of economic value tends to be a function of these value drivers.

The value chain becomes even more complex (see Figure 1.2) when taking into account the whole supply chain perspective. In reality the value is the result of a complex entanglement of easily measurable (as material costs), and not-so-easily measurable (as the supply chain responsiveness) quantities.

Efforts to "measure" supply chain performance has traditionally focused on a variety of accounting-based measures including an assortment of cost-based numbers such as inventory turnover rates, cycle-times, defect rates, and many other similar metrics. In fact, the "science" of such metrics and

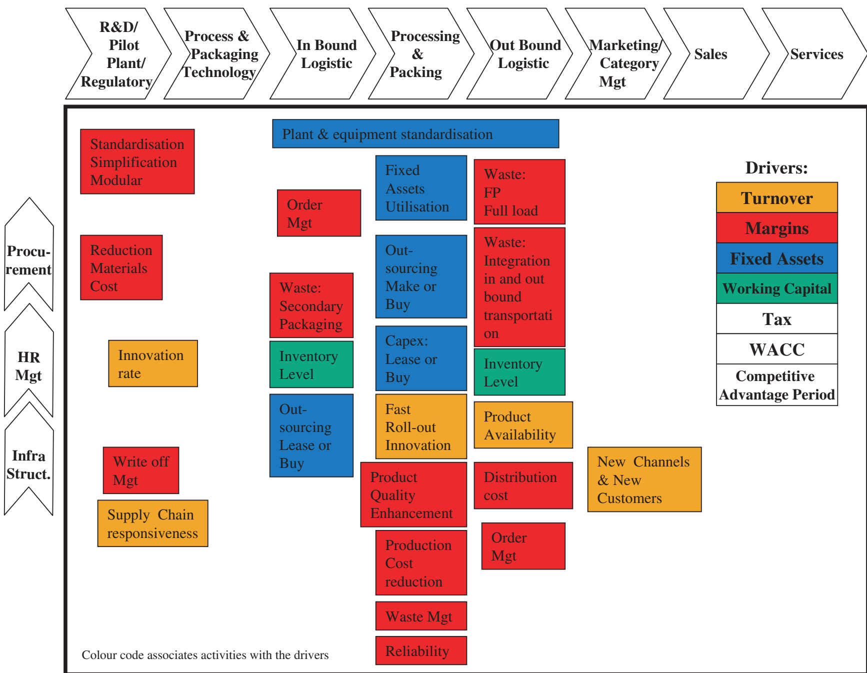

Figure 1.2. How value drivers are linked in the value chain, in a highly complex entanglement of easily and no-so-easily measurable quantities.

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operation analysis has developed over time, aided more recently by the emergence of computers with the ability to crunch massive amounts of data. Operation analysts have a real-time ability to take the pulse of a company's global supply chain system on a minute-by-minute basis. Unfortunately, the ability to evaluate performance by the numbers, while saying nothing about how effectively such measurability is contributing to the creation of economic value, can satisfy the ego of keeping everything under control. This is true for several reasons.

Traditonal Accounting Measures are Surpassed

Firstly, often times the numbers are managed to mask a bad quarter or to make good numbers look even better. However, if performance is evaluated on a cash-flow basis, these distortions disappear and the focus begins to shift to the creation of economic value. These kinds of "distortions" also occur where investment in working capital and plant and equipment are concerned. For example, as a company grows sales there will normally be an associated increase in working capital. Focusing strictly on manufacturing, that means an increase in investment in cash and marketable securities to support supply chain related cash outflows and increased investment in inventory. Investment in inventory involves cash payments for materials, labor, and overheads. These cash outflows are, of course, reflected as assets on the balance sheet, but they are not included in cost-of-goods-sold, a commonly used measure for evaluating supply chain performance. Correspondingly, accounts payable represents, among other things, unpaid bills related in part to manufacturing and this tends to overstate cash outflows associated with the cost-of-goods-sold.

Plant and equipment are depreciable assets and they are accounted for at cost. This cost is allocated over the life of the asset and presumably reflects the rate at which these assets are being used up. In reality, declared depreciation almost never accurately reflects the dissipation of economic value (these assets tend to be far more valuable in productive terms than their book value suggests) and the way these assets are depreciated can dramatically affect a variety of measures commonly used to evaluate supply chain performance. Furthermore, because depreciation is a tax-deductible expenditure but is non-cash in nature, it tends to distort earnings-based

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measures of performance. Also, because revenue flows are not adjusted for incremental investment in plant and equipment, any earnings-based measures of supply chain performance are further distorted. This is clearly not the case if the focus is on cash flow and, correspondingly, the creation of economic value.

Secondly, accounting-based measures of supply chain performance are inadequate for judging whether a company is world-class because they ignore the time value of money. Economic value is based on the presumption that a euro of cash received today is worth more that a euro of cash received next year. And there are countless examples of "growth" companies that have invested in inventory and plant and equipment only to see sales and earnings grow and the value of the business decline. To create economic value, management must generate operating returns on invested capital that are greater (perhaps much greater) than the company's cost of capital. None of the measures commonly used to evaluate manufacturing performance effectively address this reality.

Thirdly, accounting-based measures of supply chain performance are inadequate to deal with risk. A Company's cost of capital is in reality a risk-adjusted hurdle rate that reflects the economic return demanded by investors. With this in mind, even the most casual observer would recognise immediately that none of the broadly used measures of supply chain performance, accounting based or otherwise, effectively adjusts for the risk inherent in a strategy.

Finally, the need to generate and drive growth. Enduring business success only comes from growth, consistently achieved over many years. While today's low inflation, highly competitive environment can make sustained growth more difficult to achieve, investor demands on companies to achieve growth are as insistent as ever.

The constant strive for growth

There are two key processes in the management operating system that focus on growth, which apply to every business and every market. The first process is a long-range strategic plan (envision the future). You assess your own position and that of your competitors, as well as the overall market environment, to see what kind of growth you can get. The second process focuses on identifying the key initiatives that will be needed to reach that

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growth target. This really helps lay out all the opportunities as to where the growth will come from.

However, these are the typically financial-based measures, but companies are also heavily assessed on culture — on values, on teamwork, on developing staff and so on. Overall performance assessment is a combination of both financial measures on one hand, and values and culture on the other.

Sometimes, the values and culture are stressed more than the financial targets. If, for example, an executive is living the values and culture, but not making the numbers, they do get more chances within the organisation. If, however, an executive is making the numbers but not upholding the culture, they do not really have a future.

There is a whole process for this — we measure it, monitor it, and reward it accordingly. You have to apply process disciplines to growth, just as you do to any other area of your business.

If growth remains the biggest challenge facing the business today, we do not lack in opportunities — from extending the core business to developing new businesses. However, to achieve a major step in growth, we need to wisely place big bets in bold innovations. Such bold moves in uncertain times with increasing stakes require us to structure our decision-making process in a way that minimises the downside whilst retaining the flexibility to exploit the upside. One can exploit traditional tools to discriminate against uncertainty. However, they do not communicate and value of 'hidden' flexibilities.

For example, Internal Rate of Return is the most commonly used tool to value opportunities. It is premised on assumptions that the decision is to be made now and future cash flows are predictable, with all the risk accounted for in the hurdle rate. It does not consider immeasurable factors, such as, benefits of qualitative/strategic positions. In reality, we make a series of decisions as we react to changes in the environment, or as we acquire new knowledge — this in effect is exercising options.

How to turn uncertainty into value

Since most business decisions are in reality about managing options, we can use options to improve decision-making under uncertainty in every

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business. Options are about flexibility. The greater the uncertainty, the more valuable the options become as they give flexibility to take the upside or limit the downside. In managing large innovation portfolios, we are currently faced with many options questions. We need to embed options thinking and provide options tools to help pick the winners.

The options approach to managing uncertainty involves adopting the thinking that uncertainty has value: widening the field to include other ideas could fuel other growth opportunities.

There are options in many parts of our business. The options approach can be applied in many aspects of our business:

- Marketing: managing a brand portfolio, entering new markets and alternative brand investments,
- R&D: optimum allocation that will deliver the growth agenda,
- Supply Chain: from sourcing flexibility to applying option in commodity purchasing, and
- New businesses: through acquisitions and alliances.

It is clear that we need to improve the understanding and develop tools to:

- evaluate the growth created,
- review the current tools and projects indicators in the light of the residual income indicators, and
- address the risk associated with the current strategy and implementation, and the impact of change.

We aim to enhance the decision-making component of the project evaluation process by adding new dimensions, and by including in a semi-quantitative manner strategic considerations.

We are aiming toward a new decision-making tool, which includes several components. A Residual Income financial indicator, and a Capital Scale Index, are purely based on hard cash flow estimate. Less quantifiable issues are instead summarised into two matrices leading to the Growth index and the Risk Monitor Method index.

Value generation has become a critical factor not only in project evaluation but also in strategic planning for growth. There are many forces driving

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a company to continually pursue higher value and to focus on bottom line delivery. These include:

- globalised competition with companies for resources and markets,
- continuing changes in customer requirements, and
- market maturity.

As a result, traditionally accepted causal business relationships (such as the direct relationship between winning orders, market share, and long-term profitability) have been fundamentally challenged. Companies need to understand the impact of value creation and appropriation of long-term market success, to understand value drivers and their interaction, and to develop evaluation tools that will guide their development.

The concept of "value" may have different meanings to various stakeholders within a company. Moreover, as companies become increasingly complex and able to pursue more value creation opportunities in increasingly an uncertain environment, it becomes more and more difficult to manage business growth and value generation in a systematic way. Currently, value research is dominated by the concepts of Value Based Management (VBM) (Arnold, 2000) or Economic Value Added (EVA), or any other Residual Income (RI) financial indicator, which emphasise quantitative calculation of value creation or measurement, and which have a background in the disciplines of microeconomics and accounting. However, these concepts have limitations, such as, the difficulty of applying quantitative methodology to real world issues and their restriction to the evaluation of historical events. As a result, RI indicators and VBM have not been successfully linked to strategic planning, and therefore, have little influence on strategic positioning and value development for the future.

How to quantify the value added by intangibles

Strategic value adding (StVA) studies (Fine, 2002) seek to identify critical determinants of strategic value assessment. However, the StVA model (Probert, 1997) largely follows the make-or-buy decision model and ignores new business propositions and strategic positioning in the value chain. The synthesis process also lacks detailed content and an implementation procedure. Thus, there are many theoretical and practical gaps-not only in

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establishing the interactive relationship StVA and RI, but also in the concept of StVA itself, emerging as it does from strategic management disciplines in many different schools (Scott, 1998; Botzel, 1999; Parolini, 1999; Bovet, 2000). We have clearly articulated the need for an improved decision-making process and ideally a tool that is derived from an improved philosophy of how to make a decision under uncertainty.

In this book, we propose a performance indicator, named Project-Applied Differential Operating Value Added (PADOVA), which has been derived from current best practices in business evaluation and state of the art project management literature.

There is a way to improve these financial indicators by including the impact that project lifetime, and the impact that choices/options available to the management, during the business life, have on the business plan evaluation. As examples of real options, we consider in this work the option to grow or to shrink the business activity. The improved financial indicator, named Operating Value Added (OVA), will be compared to classic indicators, such as Shareholder Value Added (SVA), and Economic Value Added (EVA).

Issues exist with the implementation of the Net Present Value (NPV) concept in project appraisal. Our purpose is to provide some theoretical background and justification for the adjustments we propose to standard NPV project appraisal methodologies. It is well documented that the application of NPV within project appraisal often involves making numerous assumptions, which ignore critical business considerations. This fact partly explains why many managers still cling to older, often more intuitive techniques, such as payback time or Internal Rate of Return (IRR) and why numerous extensions of the NPV method, such as real options, have emerged. It is generally prudent to assume a greater discount rate for portions of the project farther out in the future to account for rapidly increasing uncertainty augmented by increasing competitive and industry risk. We propose an alternative method to adjust the discount rate to correct NPV bias, which we shall name the Enhanced NPV (ENPV).

In addition, we shall discuss how to address project capital scale issues. When the size of a project's cash flows (*i.e.* project scale) can significantly alter a company's financial structure, the company's cost of acquiring debt and equity capital may increase or decrease depending on the changed risk

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profile. Managers often employ the Return on Investment (RoI) and other related measures, such as Return on Net Assets (RoNA) alongside the NPV technique to normalised profit indicators for project scale. However, these measures themselves do not give an adequate account of the size of the capital at risk. We shall propose an operational standalone measure, named Capital Scale Index (CSI), for the scale of capital investments.

On the other hand, business performance measurement (BPM) research has developed numerous methodologies which have been typically more qualitatively-oriented (Lynch, 1991; Kaplan, 1996) and more focused on operational efficiency (Neely, 1995). While these popular techniques in many ways address many of the shortcomings of traditional financial indicators, their application is usually on an *ex post* basis (*e.g.* operations auditing) or in a detached corporate setting (*e.g.* strategic planning).

A New Approach to Value

We propose to integrate many of these advances, as well as components from classical business strategy, directly into project evaluation to ensure *a priori* consideration of key strategic issues at the outset of each project. We also propose several ways to enhance and correct the biases of the existing residual income methodologies.

The growth index essentially attempts to capture all non-financial sources of value growth within a prospective project. Initially inspired by Fine's analogous concept of "strategic value added" (Fine, 2002), the index was entirely rebuilt based on the following considerations:

1. The need to readdress fundamental shortcomings of the residual income approach, namely issues of quantifiability, externalities, uncertainty, and path dependency
2. The need to bridge the dichotomy between value creation and appropriation, prompted by older distinctions between the resource-based view and the market-based competitive forces framework (Porter, 1980)
3. The need to jointly and proactively pursue supply chain value, operational/manufacturing value-added, and customer value (Parolini, 1999), and
4. The need to incorporate advances in Business Performance Measures into project appraisal an *a priori* basis.

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We identified the value of a project to be based on two major elements:

Operational value

- Projected revenues and profits,
- Operational effectiveness — facilitates achievement of existing and potential operational requirements,
- Operational efficiency — potential for continuous improvement/cost reduction and incorporation of best practices, and
- Operational externalities — immediate synergies vis-à-vis other existing projects.

(Though the latter three are included implicitly within cash flow projections, the need to proactively manage these critical issues demands their separate treatment)

Business value

- Resource accumulation — resources accumulated yielding potential rents
- Capability development — capabilities developed impacting future projects
- Industry structure/conduct — impact on industry structure and level of competition
- Business characteristics — changes induced in key industry operating characteristics and order-qualifying/-winning criteria

We propose to evaluate these two elements on four different interrelated levels:

Process
1. Product development
2. Product delivery

Linkages
3. Customer involvement
4. Supply chain management

Decision making cannot be focused mainly on the best

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- Maximum return/profit,
- Minimum cost,
- Shortest time of completion.

In supporting decision-making under uncertain conditions, the business manager needs to take into account the minimum risk. All risks must be identified and assessed to ensure that they do not adversely affect the business decisions.

Our thoughts

The proposed methodology, PADOVA is composed of four independent elements:

(1) Residual Income evaluation,
(2) Capital Scale Index,
(3) Growth Index, and
(4) Risk Index.

The overall project assessment should take into account these four different elements into the final evaluation, so that the project can be assessed from a holistic point of view. In more detail:

(1) The *Residual Income* evaluation is based on the projected cash flow of the project, where substantial improvements have been added with respect to traditional RI indicators. We have provided for:
    (a) quantitative evaluation of **management flexibility** along the time-line of the cash flow forecast, in term of Real Options theory;
    (b) inclusion of the **project life-time**, with the concept of the profitability parabola; and
    (c) time variability of discount rates, and consequent increasing **forecast unreliability** at long times, in the form of an enhance NPV calculation;

(2) The *Capital Scale Index*, is a simple acid test extension aimed at promoting projects involving a **lower total capital invested** up-front.
(3) The *Growth Index* is based on two simple one-page questionnaire testing wheather the project will impinge on key **supply chain drivers or business drivers**, which are grouped along four categories: Product

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Development, Product Delivery, Customer Involvement, and Supply Chain Management. The results are summarised into a matrix, which is organised in seven columns representing the strategic thrusts: operational effectiveness, operational efficiency, operational externalities, resource accumulation, capability development, industry structure, and business characteristics.

(4) *Risk Index* is an assessment of the risk involved in undertaking a new project and evaluating the risk of the probability of occurrence and its manageability.

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Reflection on Learnings

"What three (or four) lessons have we learned?"

1. The pace of change has increased dramatically in recent times. The global dimension of information, borne out of the IT and communication (*i.e.* Internet) progress, has enabled accessibility beyond what was imaginable. Everything seems to be possible now! No rules, no barriers, and no hurdles. Fast and easy for everyone.
2. The world of business is not immune from chaos. The decision-making process needs to change in order to reflect a more complex and complicated network of opposing forces which drive the landscape of business reality today.
3. As a result, current practices and paradigms need to change in the right direction. A new way of making business decisions is needed, which builds on two concepts:

   — there is always room for improvement in current accounting measures
   — the proposed improvements should always be easy to understand and easy to implement

4. Our response to this need for change is two-fold:

   (a) a mediation between strict accounting rules and not-easy-to-measure variables, which are linked to intangibles (*e.g.* a 'quantitative value' of flexibility)
   (b) an improvement beyond the existing methods of accounting to include new concepts (*e.g.* the time-effect of profit)

"How do I put them into practical application?"

A. When making a business decision, go beyond standard pay-back time and residual income-based measures, and be open to more advanced value-based measures, which quantify not-so-easy to measure variables such as the time effect on profit, management flexibility, and so on.
B. Always balance out rigorous decision-making analysis and pragmatism.

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C. At the end of the day, do not just base your business decision on a single summarising quantity, rather strive for an integrated approach that provides you with a short list of indicators (a scorecard) which is able to cover several different and complementary aspects of the same issue.

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